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## *ESSAYS AND CASES.*

### ART. I—*Observations on* MR. GUTHRIE'S *Double Cataract Knife.*

BY THE EDITOR.

MR. GUTHRIE, the inventor of this instrument, is one of the Surgeons of the "Royal Westminster Infirmary for the cure of Diseases of the Eye." In the second edition of his valuable Lectures on the operative Surgery of the eye, published at London in 1827, he describes the instrument with its application and advantages, in the following words:

"In order to avoid some of the difficulties attendant on the division of the cornea, Dr. F. Jager, of Vienna,* has proposed a double knife, one rather smaller than the other, attached by a button screw, yet capable of sliding upon it by pressure with the thumb, for the purpose of completing the incision of the cornea, when the punctuation is completed by the larger and lower one. It is to be introduced in the same way as Beer's knife, not parallel, but nearly perpendicular to the cornea; and afterwards carried across the eye, exactly like the single knife, with the blunt edge, or back, following an ideal line drawn directly from one side to the other, and with the external side of the fixed blade parallel to the iris, at the usual distance from the junction of the cornea with the sclerotica. When the point of the greater knife has transfixed the cornea at the inner side, pressure is to be made on the button head with the thumb; the smaller knife is, in consequence of the pressure, pushed forward, while the greater keeps the eye steady, until the operation is finished. A needle is then introduced to lacerate the capsule, and the opera-

*See Loudon's Short Inquiry into the Principal Causes of the Unsuccessful Termination of Extraction by the Cornea. London, 1826.

tion concluded by gentle pressure on the ball, if necessary, to displace the lens from its situation.

"In employing the double knife, we may use it as we would a Beer's knife. After the counter-punctuation is made, we have a support for the ball in the greater knife, while the cut is performed by the smaller. There is no necessity for dragging forward the eye to enable the operator to complete the incision."

The advantages above described, have not all been observed in the trials I have made with the instrument, and I suspect they will be found to be more specious than real. I am not, however, as yet competent to give a decided opinion either for or against the affirmative one of Jager, or of our author, Mr. Loudon.

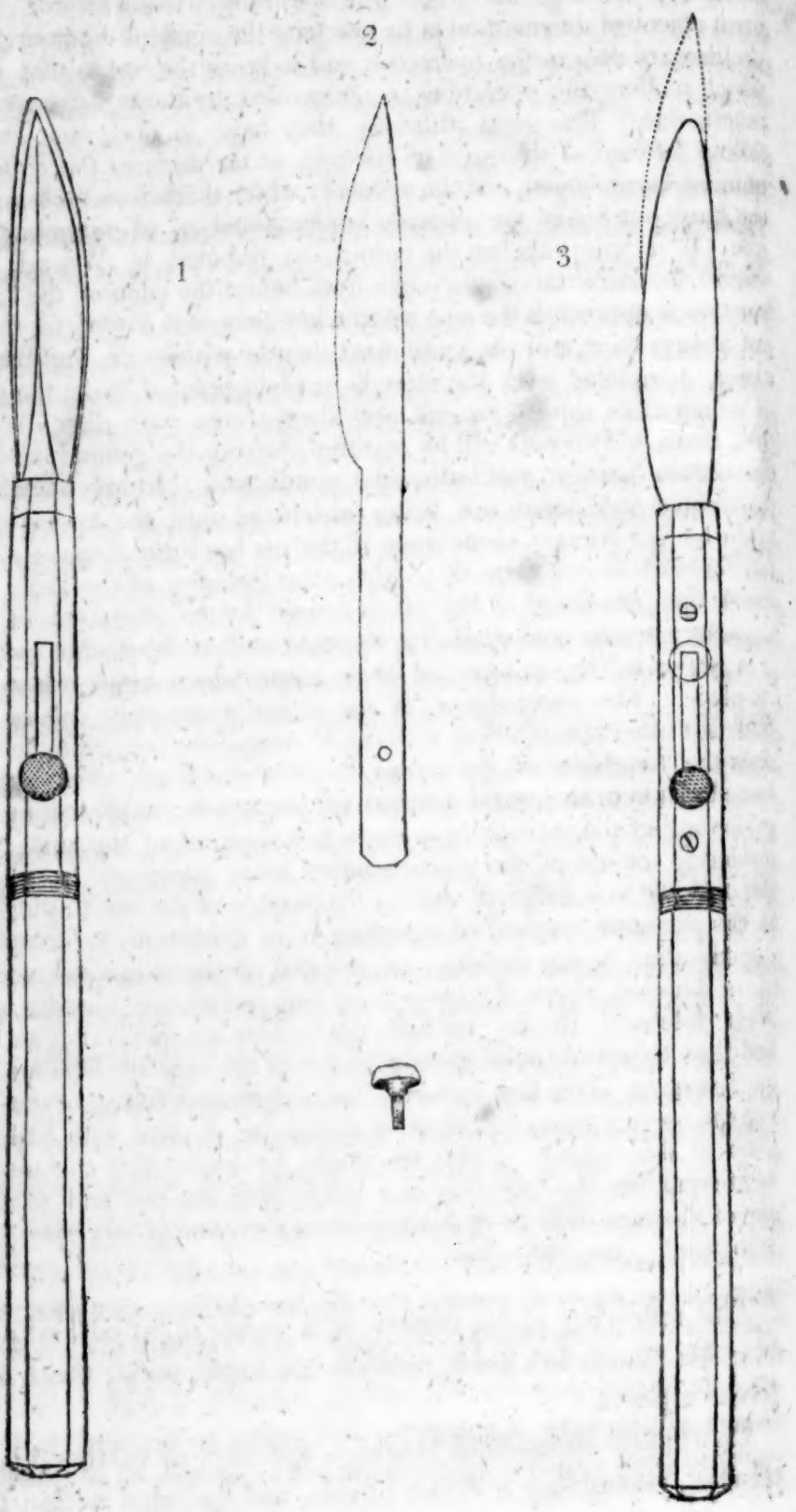
In denying, however, to this instrument, the merit which has been attributed to it, I am willing to concede that of its being the foundation for the construction of another, which I believe to be more perfect—to be capable not only of preventing nearly all the difficulties and dangers which occur in the extraction of the cataract, but of obviating them when they have occurred, either from accident, or any defect in the operator. It is a double instrument, one part being a cataract knife of the shape of Wenzel's, the other a silver blade of the same form, but larger and blunt. (See Plate.) The sharp steel knife is attached to the silver blade by a button screw in the handle, which admits of the knife being pressed forward in the same manner as Jager's; whilst it is so nicely and closely fitted to the silver blade as to form one instrument, neither the point nor the edge catching when the finger is pressed along it. An opening is to be first made in the cornea, with a common large Wenzel's knife (which I prefer to Beer's;) and of such a size as to admit the double instrument, being the first step of the punctuation: the knife being withdrawn the aqueous humour escapes, and the iris is pressed forwards against the cornea, the eyelid being allowed to fall over it. If any protrusion of the iris should take place at the opening in the cornea, the protruded part will return to its place on gently rubbing the eyelid with a silk handkerchief, a piece of sponge or the finger. The eyelid is now to be raised, and the double instrument introduced at the opening, the silver blade being next the iris. The silver point being larger than the steel one, easily raises the cornea and presses back the iris; so that by alternately raising and depressing the point of the instrument, it is readily carried across the eye in front of the iris and pupil, until the silver point touches the inside of the cornea, either immediately opposite the point of entrance, or as much above or below as the operator may think fit. The thumb, which has hitherto been resting on or near the button screw, is now made to press it forward, and to protrude in consequence the sharp steel blade through the cornea, when the instrument readily cuts its way out, and completes the section of the cornea.

The principle on which this instrument is used is diametrically opposed to all others. The great object of Wenzel, Beer, and Jager, and of all operators, is to prevent the evacuation of the aqueous

humour, until the knife has passed across the eye through the cornea at the opposite side, and has begun to cut its way downwards. The great object of this method is to evacuate the aqueous humour, as a preliminary step to the operation, and to bring the eye to that state which renders the operation recommended by those surgeons impracticable. The great difficulty they have to encounter is the falling forward of the edge of the iris, at the moment the aqueous humour is evacuated, and the necessity which then arises for bringing the knife out before the incision is completed, or of wounding the iris. It is true, rubbing the cornea, as directed by Wenzel, will sometimes cause the iris to move from before the edge of the knife, but this is only when the punctuation has been well made; for it will not always do it, and the knife must then be withdrawn, and the incision completed with the scissors or blunt-pointed knife, the edge of which often injures the iris, and always cuts with difficulty; so that three or four cuts will be required, leaving the general edge of the cornea uneven and indisposed to adhesion. In my operation, the double instrument not being introduced until the eye is quiet after the first attempt made upon it, the iris has little disposition to fall forward, as it is termed, or turn upon the edge of the knife, because this movement of the iris is caused by the evacuation of the aqueous humour; and when it is disposed to do so from other causes, it is prevented by the blunt or silver blade, which keeps it back in its place. The unsteadiness of the patient's eye only delays, but does not otherwise interfere with the success of the operation, neither does the toughness of the cornea, both of which are often serious impediments in the usual method of extraction, as preventing the perfecting of the incision by a single introduction of the knife, and rendering the use of the round-pointed knife necessary to enlarge the opening to a sufficient size for the passage of the lens through it. In the common method of operating it is dangerous to complete the operation by one incision, on account of the spasmodic action of the muscles, which often expels the lens and vitreous humour with great violence. By my method, this sudden spasmodic action has had time to subside, with the evacuation of the aqueous humour, by the formation of the first opening, and subsequent falling of the lid, and the operation may therefore be completed at once with little or none of this danger. Upon the whole, I consider that this instrument simplifies the operation in a remarkable manner, and renders one of the most difficult operations in surgery, one of very easy performance." pp. 343—346.

The following plate, copied, with some slight alterations, from Mr. Guthrie's book, exhibits his knife, under three different aspects.

Figure first shows both blades;—the steel or cutting blade pointed, resembling a Wenzel knife, and included within the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contour of the silver blade or guard, which is obtuse, at the point and edges, and lies underneath. This is the knife for the right eye, and the blades have the relative position, which is proper when they are to be introduced into the eye. Figure second exhibits the cutting blade of the same side, detached. The hole in the shank receives the screw point of the knob, which is represented below. Figure third shows the knife for the left eye; with the cutting-blade projected, as it is, at the time when the section of the cornea is completed. The silver blade in this figure is underneath.

Soon after Mr. Guthrie's book reached the United States, I requested Dr. Hays, of the Eye Infirmary, at Philadelphia, to put it into the hands of one of the ingenious cutlers of that city, Mr. Rohrer, and have two sets of these instruments made for me, which was obligingly done; and one of the objects of this paper is to state the results of my trials with them.

Appropriating one set to operations on the eyes of dead animals, I used it a number of times, and have since operated with the other on three patients of the Cincinnati Eye Infirmary.

From the language of the ingenious inventor, it could scarcely be supposed that the least difficulty would attend the use of this knife, and in his experienced hand, this may, perhaps, be the case; but considered as an *instrument which simplifies the operation in a remarkable manner, and renders one of the most difficult operations in surgery, one of very easy performance;* in other words, as an invention which so far obviates the the difficulties attendant on the ordinary operation, as to enable the inexperienced to perform it with facility, safety and success, its claims on our confidence are not unqualified.

I. The first difficulty attendant on its use, is that of making, with a common Wenzel knife, as Mr. G. directs, an incision sufficiently large to permit the double knife to cross the disk of the iris; but if this be not done, the operation cannot be successful. When the Wenzel knife is introduced no further than the centre, or inner edge of the pupil, the aperture will be too small to admit the Guthrie-knife; and, if, to increase

the dimensions of the incision, the Wenzel knife be made to traverse the iris, the operation might, in general, be safely completed without withdrawing that instrument: in other words without Mr. Guthrie's knife. Those, therefore, who are about to use his knife, should do one of three things, in reference to this difficulty. 1. In withdrawing the Wenzel knife, the handle should be rotated on the point, by which the cornea will be cut to a greater extent, than by the mere puncture; but as the aqueous humour will begin to escape, as soon as the rotation commences, this method may not be without its dangers to the iris. 2. After withdrawing the knife, one of Mr. Guthrie's silver guards (the cutting blade being detached) may be introduced; and, while the iris is thus protected, the cornea, may be cut, by successive strokes with an iris knife. This operation is safe, but tedious; and renders the lips of the wound more or less irregular. 3. Instead of using the Wenzel knife, one much less tapering might be made; which from its great breath would make a sufficient incision by the time the point had reached the outer margin of the pupil. I perceive no difficulty either in the construction or use of such a knife; and, it would effectually obviate one of the greatest objections to the new instrument.

II. Having succeeded in introducing the Guthrie-knife, the inexperienced hand encounters a new difficulty, which nothing but practice can surmount. While the silver blade is pressed forward and kept firmly in its position, across the anterior chamber, the cutting blade is to be projected. In doing this the silver blade has a tendency to recede; and without proper care we shall move it backwards, instead of moving the other forwards. If the first incision should not have been sufficient, to permit the point of the silver guard to reach the cornea, on the opposite side, this recession will almost inevitably occur. It can only be prevented by pressing the point of the guard against the cornea, where the second puncture is to be made, sustaining that part by the middle finger of the left hand; placed over the caruncula lachrymalis. In this manner the guard may be kept firmly and steadily in its place, while the cutting blade passes across

the eye, and pierces the cornea on the inner side. If on introducing the instrument, the preparatory incision should be found to be too small, it should be withdrawn, and the cut made larger, with the scissors, or preferably, in the manner pointed out above; and the operator should not attempt to enlarge it by projecting the cutting blade, and at the same time moving the guard across the eye. The two motions, with the same fingers, could not be performed with success. Hence, as it respects the whole operation, the great importance of a free initial puncture.

III. When the muscles of the orbit are prone to convulsive action, the eye ball cannot be kept from rolling, without a degree of pressure, that causes more or less *prolapsus iridis*, at the moment when we attempt to introduce the double knife. I am aware that in cases of spasmodic action, the vitreous humour is liable, under the old method, to be thrown out, and that Mr. Guthrie's method will diminish that liability; but in doing this, it evidently, produces a different difficulty, that which I have named, and in some cases this may be more momentous than the one which it obviates.

IV. The passage of the instrument between the cornea and iris, both relaxed and quite in contact, is not without its difficulties; for each of them, in turn, is disposed to catch and wrinkle on the silver point, and the latter to float around the obtuse edges of that blade, so as even to be in danger of injury from the steel knife.

V. The thickness of the silver blade, if it be so strong as not to bend, is such, that if the first incision be not made extremely near to the sclerotica, the cut of the steel blade, will be so far towards the apex of the cornea, that the central part of the eschar may, to a certain degree, interfere with the vision of the patient.

VI. After the perfect evacuation of the aqueous humour, from both chambers of the eye, through the initial incision, and the consequent collapse and relaxation of the cornea, that membrane probably becomes tougher, and more difficult to cut; so that the remainder of the incision cannot be executed with the same facility, as in the ordinary operation.

I have used Mr. Guthrie's knife three times. The first case terminated unfortunately. I will state the manner, as it involves several of the difficulties which I have pointed out; and may possibly be the means of preventing a similar result, in the first trials which other operators may make with his instrument.

The patient, a lad 14 years old, laboured under congenital cataract. I had operated on him according to Mr. Sanders' method and found the body of the lens unabsorbed and soft. Immediately after the operation it suffered the usual increase of opacity, and induration. At the end of several weeks it had undergone no perceptible dissolution, and a portion of it appeared to plug up the pupil. As the eye was well formed, the operation of extraction seemed quite practicable, and I determined on using Mr. Guthrie's knife. The initial cut was made with a large Wenzel knife, introduced until the point was near the nasal edge of the pupil. On withdrawing that instrument and attempting to insert the Double knife, I found the spasmodic action of the muscles of the globe (as is usual in congenital cataract) so considerable, as to require more than the ordinary pressure to keep it steady; and this pressure united with that of the convulsed muscles, protruded the iris into the incision, and against the cornea to such a degree, as rendered this part of the operation exceedingly difficult. By gentle efforts, however, the instrument was insinuated, without injury to the iris, as far as the Wenzel knife had been inserted, when the puncture would not suffer it to advance. I had then either to withdraw it and enlarge the incision, or to attempt its enlargement, by projecting the steel blade. As the tendency to a protrusion of the iris was so considerable as to give the appearance of difficulty in executing the former, I decided on performing the latter. I accordingly attempted to project the cutting blade, and as fast as it should enlarge the opening to push forward the silver guard; but from the unsteadiness of the globe, and the complex movements required from the same fingers; the cutting blade instead of traversing the cornea, at that time closely in contact with it, pierced that membrane a little be-

low its centre, and cut its way out. Thus, instead, of a semicircular cut, extending half round the cornea, parallel to its margin, I had a curved incision, commencing at the usual point, and terminating in front of the lower part of the pupil. Thro' this incision the lens was discharged without violence. It was followed by a moderate portion of the vitreous humour. The wound healed, and the anterior chamber was properly replenished; but the eschar as might have been expected renders the cornea opake in the centre, and prevents the admission of light. I now believe, that had I withdrawn the double knife, and enlarged the aperture, in the manner, which I afterwards adopted, the result might have been favourable.

The subject of the next case was a man 50 years of age, whose eye was was steady. The initial puncture was made as before, and enlarged as follows—detaching the steel from the silver blade of another Guthrie-knife, I introduced the latter; and used it at once as a defence to the iris, and a director, for a small scalpel, with which I continued the incision, until it would freely admit the double bladed knife. This I then passed, without much difficulty, across the anterior chamber; and pressing the point against the cornea of the opposite side, supported by a finger of the left hand, I completed the incision without difficulty, and the case terminated favourably.

The subject of the third operation was a young man. Having to operate on the right eye, I determined to make the incision upwards. The cornea was punctured as before, but from the great tendency of the globe of the eye to role upwards I found it quite impossible to enlarge the aperture in that direction, and was obliged to operate downwards. From the unsteadiness of the eye, the lengthening of the cut was a slow operation, but I at length succeeded, and was enabled to push the double knife across the eye, and finish the operation without accident.

In both these cases, the incision was further from the junction of the cornea and sclerotica than is desirable, in consequence of the thickness of the silver blade; and I am disposed to think that an iron blade, which might be made much thinner, without bending, would be preferable.

From this review of the difficulties connected with the practical application of Mr. Guthrie's knife, I am compelled, to believe, that its value is less than he has supposed. It must be recollected that he offers it as a substitute for the knives of Beer and Wenzel, on the ground of its simplicity and safety. His recommendation, in fact, amounts to this, that while repeated trials, many of them disastrous to the eye on which they are made, have been found indispensable to a competent degree of skill in the old method; the new one is so easy, as to render long experience unnecessary to a successful result. But, although intrinsically a valuable method, I am disposed to think that a course of practice, little short of that which would make the operator familiar with the old method, is absolutely necessary to any tolerable perfection in the new.

After all, however, Mr. Guthrie's knife is not without its advantages. Whenever, from any cause, the further introduction of the common cataract knife would endanger the iris, and its withdrawal lead to a failure in the operation, Mr. Guthrie's knife offers an admirable resource; and cases of this kind may frequently occur. But its value when the muscles of the eye are powerfully convulsed, is more disputable, on account of the pressure of the iris against the wound in the cornea. It may tend to preserve the vitreous humour, but in the attempt to introduce it under such circumstances, there is danger of injuring the iris. On the whole it seems to me, that Mr. G. has overlooked the objections to his method—no uncommon thing in men of inventive genius, and sanguine anticipations.

In concluding I may say a word on the means of preserving his knife from oxidation. Whenever two metals of different degrees of oxidability are suffered to remain nearly in contact, with a fluid between them, a galvanic process is set up, and one of them will rust. Thus when the steel blade of the Guthrie knife is oiled and suffered to remain in connexion with the silver guard, it becomes speedily oxidated, as I have experienced; the two blades should, therefore, be kept asunder with cotton or soft paper.

ART. II. *Practical observations on the Uterine Hœmorrhage, connected with Abortion and Parturition.* BY THE EDITOR.

Few subjects have engaged the attention of Obstetricians, more than Uterine hœmorrhage. Without claiming to have had any uncommon share of obstetrical practice, I may say that, in attendance on many hundred patients, belonging to that department of the profession, I have been presented with almost every kind and degree of uterine hœmorrhage, and have not, in the course of more than 20 years practice, lost a single patient with that formidable malady. Was this result ascribable to new views of the pathology of that affection and a new mode of practice, it would certainly be proper to report them. I have relied, however, on remedies generally known to the profession. Ought I then to consume the time of the readers of this journal, by setting forth the plan which I have followed? I see no objection to such a publication; inasmuch as it can scarcely fail to be useful, for practitioners, occasionally, to draw monographs of their practice, even in maladies the most curable. I shall state what I have to say under three distinct heads—Prevention, Suppression and Restoration.

## I. OF PREVENTION.

1. When uterine hœmorrhage is expected, either, at the proper time of parturition, or before, much may be done to avert it. If the patient be of a sanguine temperament and full habit, blood-letting is indispensable; and in proportion to the extent to which it is carried, will the danger of hœmorrhage be diminished. There are, however, feeble and dyspectic constitutions, in which a resort to this preventive remedy, would be unavailing, and, indeed, prejudicial. In such constitutions, an indiscriminate use of the lancet, in the period of utero gestation, is altogether improper, and has often produced abortion.

2. Another prophylactic is purging, which, by weakening the action of the heart, diminishes the impulse into the uterine arteries; and by promoting secretion and peristaltic action, in the bowels, seems to lessen the determination to the uterus.

3. A third and most powerful means of prevention, is the liberal administration of opium or laudanum. This should follow the blood-letting and purging, when those remedies are employed. The quantity given, should be great enough to exert a crippling influence on the circulatory system, which, in vigorous constitutions, cannot be easily affected, if venesection be not premised. The power of the narcotic over a hœmorrhagic tendency is so great, that when there is no particular degree of plethora, I feel little apprehension for any patient, after being brought under their influence.

4. A recumbent posture, a hard bed and warm feet are all requisite; but can, by no means, be relied on to prevent hœmorrhage, where the tendency to it is very great. I cannot, however, too strongly insist on the necessity of perfect rest and physical and moral quiet, immediately after delivery. Many a patient has been brought into a most reduced state, simply by a neglect of these precautions.

II. Of Suppression.

1. When uterine hœmorrhage begins, whatever may have been the vigour of the circulation, it is speedily brought below the standard of health. Venesection, therefore, however valuable, as a means of prevention, is wholly inadmissible as a means of cure, except in the earliest stages.

2. But the same remark does not apply to opium, which I have found adapted to every stage of this *profluvium*. The quantity required is sometimes very great; and if it be not thus administered, but little benefit will result from its use. Two or three grains of solid opium, or a large tea-spoon full of strong laudanum, may be given at a single portion, and repeated once or twice, according to circumstances. Twenty or thirty years ago, the union of acetate of lead, and ipecacuanha, with opium, was strongly recommended, by several practitioners, especially the late professor Barton. I have often resorted to the combination; but am by no means satisfied of its superiority over uncombined opium. When employed at all, it should be in the early stages, when the sedative power of the two adjuvants may exert a favorable influence over the action of the heart and arteries. In exhausted

states of the system, this influence is not beneficial, nor, even, safe.

3. The abdominal bandage, immediately after delivery, should never be neglected, when hœmorrhage is threatened. It may be promptly applied, in a temporary way, over the clothes of the patient, and readjusted after some hours. By compressing the uterus between the *parietes abdominis*, and the contained viscera, it contributes powerfully to promote the tonic contractions of that organ, so essential to the suppression of hœmorrhage.

I have heard fears expressed, that a tight bandage, immediately after parturition, might do harm; but such apprehensions are groundless. It is only the unskilful application of it that can do injury. As too often applied, it is a mere cord drawn around the patient, over the hypochondriac and epigastric regions. Such a ligature interferes with the action of the diaphragm, and by its pressure on the scrobiculus cordis, inevitably distresses the patient, while it is far from fulfilling the intention with which it is employed. The bandage should be broad and firm, and passed over the iliac, hypogastric and umbilical regions; and ought to be drawn so tight, especially below, as to compress the viscera firmly against each other, for on this all its efficacy depends. Now this compression is attended with three excellent effects: First, it maintains the excitement of the heart and brain; and, in bad cases, prevents syncope:—Secondly, it prevents or restrains hœmorrhage:—And, thirdly, it facilitates the separation and discharge of the placenta. To promote the last object, it is common to direct the patient to make long inspirations and expirations, and to employ frictions over the region of the uterus; but the former do far more good with, than without the bandage; and the latter are, in almost every respect, inferior to it. To its influence, chiefly, I ascribe the fact, that I have never yet, in my own practice, been obliged to introduce my hand into the uterus for the purpose of separating the placenta from its attachment.

In speaking of the safety of the tight bandage, it will be understood, that I refer to the period immediately after deli-

very; which is, in reality, the only one that imperiously requires it. At a subsequent time, when the circumstances that favor hœmorrhage no longer exist, and the sensibility of the abdominal parieties and the contained viscera, has become exalted; the tight bandage would be injurious, and is, in reference to the objects for which it was applied, quite unnecessary.

4. Cool air and cold topical applications, are of great moment; but too much reliance should not be placed on them. as long as the heart and arteries retain a considerable degree of vigour, they are highly beneficial; but in states of the system greatly reduced, if too liberally applied, they may do harm; and in every stage, it is important to preserve the temperature of the lower extremities. The injection of cold water into the cavity of the uterus, might, undoubtedly, be resorted to, in desperate cases, with success, though subsequent hysteritis might sometimes, perhaps, ensue.

5. The Tampon is a remedy, which may often produce the most salutary effects. Of the propriety of a resort to this instrument, in cases of early abortion, there can be no difference of opinion; as the uterine cavity is then, in general, so small, that it may be filled with coagula, before the patient would suffer any alarming reduction of strength. There are many practitioners, however, who condemn a resort to it, after ordinary parturition. But even then, it does good, though it should not be relied upon to the neglect of other means. That it may prevent the external discharge, while the large uterine cavity is filling with blood, no one can deny; but this need not operate to the disadvantage of the patient, unless the practitioner takes it for granted, that there is no discharge *into* the uterus, because he has prevented a discharge *from* it. He should look well to the state of the circulation, and, also, to the animal functions generally; and if he finds them failing, he will stand in little need of a vaginal discharge, to apprize him of the continued existence of hœmorrhage. Now, in such a case, will it be diminished, by withdrawing the Tampon, and suffering the blood to flow out uncoagulated? I answer that it will not; but the reverse must happen. For

if a coagulum, produced by the restraining influence of the Tampon, in the early periods of gestation, can moderate the hœmorrhage, it is equally true, that it can do the same thing, after delivery, at the full period. I would, therefore, promote the formation and retention of coagula, within the uterine cavity; and rely upon their contact with the bleeding surface, pressed against them by the action of the external bandage, to moderate the discharge. At the same time, I would resort to every other remedy, as if the Tampon had not been employed. It is only objectionable, when it is made our exclusive reliance.

6. Few cases, in the profession, offer such alarming indications of exhaustion and debility, as the hœmorrhages which we are considering. And, what is more appalling, the discharge may continue, notwithstanding the powers of the heart are extremely reduced. Under such circumstances, internal and external stimulation, is of the utmost importance. To effect the former, brandy, whiskey, ammoniated alcohol, tincture of camphor, and other excitants, united with laudanum, may be administered freely; but the stomach is sometimes irritable, and oftener torpid, so that we shall, frequently, be disappointed in our attempts to sustain the sinking energies of the patient, by internal excitants. In these cases, the pulse becomes exceedingly feeble and empty, the respiration embarrassed, the surface pale, cool and sweaty, and the feet cold; but above all, there occurs an epigastric anguish, which suggests to the patient that death is approaching. Now, in this extremity, as well as in the approach to it, I am convinced that nothing is equal to external stimulation, with mustard. It not only arrests the declining powers of the system, but restrains the hœmorrhage, which is exhausting the patient. I feel quite certain, that I have saved the lives of several patients, by a resort to sinapisms. As no time is to be lost in these cases, the physician should, in general, take upon himself their preparation; and in the first place, the mustard which he uses, ought to be good. He should prefer the unpulverized seed, which may be crushed, for the occasion, and will be free from the ordinary adulterations.

Secondly, it should be mixed up with boiling water or vinegar, and used as hot as the patient can bear it. Thirdly, the napisms, thus prepared, should be applied, of a large size, to the epigastrium, and to the lower and inner sides of the legs. In extreme cases, when the feet are cold and insensible, we can only rely upon epigastric irritation; and its animating influence on the various functions, is, in all respects, admirable. The pulse rises in its volume, power and regularity; or, if entirely suspended, which occasionally happens, it is rendered perceptible; the death-like sensation of sinking and of syncope, is removed; and the hœmorrhage moderated. In such cases, it will not answer to rely upon applications to the lower extremities; for in their state of coldness and insensibility, the mustard will not act upon them, in due time. It is proper, however, to apply them, that when the epigastric sinapism may have revived the susceptibility of the surface generally, the returning excitement may be augmented and sustained by their action. When they excite pungent pain, and the patient becomes restive, under their impress, they may be removed; but in phlegmatic temperaments, their reapplication will often be necessary.

By these means, varied and combined, according to circumstances, I have had more success in the treatment of uterine hœmorrhages, than I have been so fortunate as to experience, from other agents in the treatment of any other dangerous disease; and am disposed, therefore, to think highly of them. In their application, I have laid the greatest stress on opium, the tight bandage, and sinapisms; and if, in my relative estimate of the value of our different resources, I have differed, in any degree from others, whose practice I have known, it has been in pressing *these* measures with greater energy; and placing less reliance upon cold vinegar, cool air, sugar of lead, and warm irons to the feet.

After every copious uterine hœmorrhage, there succeeds a period of feverish excitement, with head-ache, and morbid vigilance. The proper remedy for this condition, is alvine evacuation; which may be effected either by enemata or a cathartic. The young practitioner is often apprehensive,

however, that purging may reproduce the hœmorrhage; but of this there is no danger. He need not, therefore, suffer his patient to linger under these symptoms; but resort to the means, of which I have spoken, at an early period. They will not only afford great relief from those symptoms; but contribute equally to an abatement of the after pains, which, frequently, prove so obstinate, under the narcotic treatment. This is particularly true of emollient enemata, which will, in general, give more relief from that painful affection, than any other remedy, at present known to the profession.

### III. Of Restoration.

The recovery from copious uterine hœmorrhage, especially that connected with abortion, is generally tedious. The digestive, indeed, the nutritive organs generally, fall into torpor and depraved action. In fact, the great functions of circulation and innervation, are left more or less reduced and perverted; and their restoration is not easily effected. Stimulants, tonics, and nutrients are the means; but under an undiscerning and indiscriminate administration, it is far from being certain, that they will succeed to the satisfaction either of the patient or physician. They must be so administered, that the former do not excite headache or epigastric heat; nor the latter, acidity of the stomach. It is necessary, in short, to look diligently to the state of the great secretions, especially those of the liver, intestines, kidneys and skin. Some one or more of these will generally be found in a state of bad health, and must be treated with appropriate stimuli. Hence, it is necessary, while administering general stimulants, to employ those, also, which act upon particular organs. Thus, the secretion of bile must be maintained by the pil. hydrargyri and aloes, formed into pills with extract of gentian. Intestinal secretion and excretion, must be promoted by the same composition; by small doses of cinchona bark and jalap; or an infusion of senna, with bitters and aromatics, to which the carbonated alkalies or magnesia, may be advantageously added. The stomach must be regulated in its susceptibilities by an occasional emetic of ipecacuanha, from which the best effects will often result. The urinary secre-

tion, when deficient, must be promoted, by stimulating diureties. Lastly, the functions of the skin should be maintained by frictions, flannel, exercise, and the cold or warm bath. If we thus attend to the state of the secretions and excretions, our patients, debilitated by copious hœmorrhage, will seldom experience inconvenience from the most active stimulation, while its restorative influence will be decided.

There are too morbid states connected with, or rather making part of, that now under consideration, which frequently cause great suffering to the patient, and trouble to the physician;—I allude to hysteria, and prolapsus uteri with leucorrhœa. They are very commonly united. In patients of a sanguine and vigorous temperament, they, in general, yield promptly, to the treatment of which I have spoken; but such are not their usual subjects; and, attacking, chiefly, those of a phlegmatic or nervous constitution, they are apt to prove obstinate. It is not my intention to dwell upon the treatment of these symptoms; for, in fact, I know of little that can be done, save that which has been recommended. I may refer, however, to the speedy exhaustion, which the susceptibility of the system suffers, under the diffusible stimulants, which are usually employed in these cases. Thus the antispasmodic, which, to-day, afforded great tranquility to the nervous system, may entirely fail to-morrow; when another prescription will be necessary. It is not indispensable, however, to resort to *different* medicines, every time we prescribe anew, for when we employ composite recipies (which, in general, are most successful in these cases) a mere change in the proportion of their ingredients, will frequently answer the end in view.

As to the local treatment of the uterine system, I am by no means convinced, that it affords much relief. Astringent injections sometimes do good, but their effects are far too limited. From pessaries, I have seen still less benefit, and they give the patient more trouble, than injections. A pelvic cold bath is serviceable, if persevered in. Frictions and pharmaceutic stimulants over the sacral portion of the spiral column, are useful. A recumbent position on a mattrass or

straw bed, is, in all bad cases, quite indispensable; when the patient is not engaged in taking exercise. Walking is prejudicial, but our chief reliance should be on carriage and horse riding. The patient will often resist the proposal to go abroad, on the ground of being too weak. But the physician must decide; and he should not be backward in urging that, which, in the majority of cases, will contribute more to allay nervous irritation and restore tone, both general and local, than the whole materia medica.

I shall conclude this series of practical remarks, (extended much beyond the limits which I expected them to reach) by a reference to the injury, which, occasionally, happens to patients labouring under nervous irritation with chronic debility, from too much professional officiousness. Now and then we meet with cases, in which our choicest stimulants and tonics, however combined and administered, serve but to increase the inquietude and exhaust the strength of our patients. At the same time, there will be great apprehension of danger and perpetual calls upon us, for new and more energetic prescriptions. Under such circumstances, it is the duty of the physician to resist all importunity, and withhold all active medicines. This determination will excite new alarm; but in most cases it will be transient, and within a few days, the condition of the patient will, in all respects, be sensibly improved. During such a period, he should continue his visits, and avail himself of all the aid which can be drawn from moral influences. There is a time to withhold medicines, as well as a time to give them.

ART. III. *Observations on Fractures of the Patella.* *By* CHARLES BELL, F. R. S. *As delivered by him in his Clinical Lectures.*

[FROM THE LONDON MEDICAL GAZETTE.]

GENTLEMEN,—The cases to which I shall first direct your attention, are instances of fracture of the patella, now in the hospital; and although they are related briefly, they contain illustrations of important practical doctrines; indeed, they guide us to the principles of our treatment in all cases of fracture.

*First case.* Mary Langthrone, aged 46, was admitted into the females' accident ward, August 23d. Whilst she was at work in the kitchen, she heard her mistress call her, and as she was running up stairs, her foot slipped from one of the steps, and she fell. She is not certain whether her knee struck against the step. She was unable to raise herself up, and when her master lifted her, she discovered that her lameness was occasioned by her kneepan being broken. When brought to the hospital, there was no appearance, on the integuments of the part, as if it had been struck or bruised. The patella was fractured transversely, and tumefaction of the joint arose soon after her admission. During the first week, attention was paid to the position of the limb and body. She was propped up in bed to bring forward the origin of the rectus muscle; the limb was extended to relax the ligament of the patella; and cold lotions were applied. When the knee was in a state to admit of the fracture being set permanently, it was done in the following way:—The limb was in the first place rolled from the ancle to the middle of the thigh; compresses were then placed above the upper portion of the patella, and below the lower portion; straps, made of portions of bandage, were laid along each side of the knee, one on the inside and another on the outside. A second bandage was now applied over the compresses and the straps; it was passed over the central parts only of the latter, and the ends were left loose. These extremities of the longitudinal straps were tied closely together on each side of the knee-joint: in this manner the folds of the roller and the compresses were approximated towards the centre of the knee; and the two fractured portions of the patella were thus brought close together.

Oct. 20.—It is now about eight weeks since the accident, and the bone is united, but, it is feared, by ligament, although there is scarcely any perceptible distance intervening between the two portions. She has attempted to walk about the ward, but finds the limb very weak, and being timid, she seldom ventures to rise from her bed.

*Second case.* David Keith, aged 36, a bricklayer, was brought to the hospital, Sept. 15th, in a state of intoxication, having received an injury on the knee. Little credit can be given to the account which he himself afterwards gave of the manner in which the accident occurred; but it appears from the statement of those who were with him, that his foot slipped upon the curb-stone, so that he fell

with his whole weight on his left knee, which struck upon the iron grating of a sewer. When brought to the hospital, there was great ecchymosis over the whole front of the knee-joint; and the patella was discovered to be broken into three portions. There appeared to be a transverse fracture separating two upper and lower pieces, while a lateral portion was broken off longitudinally, and was found lodged on the inside of the condyle of the femur. This last-mentioned portion was replaced in its proper situation close to the other two. He was placed in a sitting position in bed, with orders to keep his limb constantly in a state of extension. When he became fatigued with sitting erect, he was allowed to recline backwards, but care was taken to elevate the limb upon pillows, so that the knee approached the pelvis, and the rectus muscle was relaxed. Seventeen leeches were applied to the joint, and afterwards cold spirituous lotions were kept constantly upon the parts, until the active inflammation was subdued. A bandage was applied to the limb, but as it gave pain, it was immediately taken off. When the inflammation had ceased, the knee was bandaged.

October 25th.—The union is so complete, that there is great difficulty in distinguishing where the bone was fractured. The skin which covers the patella being no longer thickened or condensed, but in its natural condition, the whole surface of the patella is found to be uniform; no indentation can be detected, to mark any deficiency of solid bony union: there is a slightly elevated ridge of bone extending transversely, which points out the situation of one of the fractures. He has been walking about the ward for some days, and is to leave the hospital to-morrow.

These two cases serve to illustrate a distinction in the kinds of fracture of the patella, which it is of the greatest consequence the practitioner should understand. In the first it was not clearly made out, from the statement of the patient, how the accident took place. For it may be a question whether the patella was fractured by the convulsive action of the muscles while she was endeavoring to save herself from falling, or whether on falling she struck the patella against the edge of one of the steps, and thus fractured it, independently of the action of the muscles. It appears, however, that the first supposition is most probable: since there was no mark of any bruise upon the integuments of the knee, and there was very inconsiderable swelling of the joint consequent on the injury.

In the second case, even although we had not the statement of the person who saw the accident, there was evidence of great injury having been inflicted. The bone was fractured into three portions. This proved that it was not by the simple tearing and snapping of the bone by the action of the muscles, that the accident occurred. Besides, there was great ecchymosis, with swelling and heat of the joint for some time. It appears, then, that the patella in the last instance was fractured by the patient's tripping upon the edge of the curb-stone, and falling upon the knee with his whole weight against

the iron spokes of the grating. This accident, besides fracturing the patella, it is to be observed, produced great injury to the surrounding structures.

We shall consider these cases separately, for it is important that we should understand clearly the distinctions between them. In the first place, we shall attend to that fracture of the patella, which is occasioned by the convulsive action of the extensor muscles of the limb, in which little injury is done to the parts around the joint: and then we shall contrast it with another kind of fracture of the patella produced by a direct blow upon the bone, by which it is splintered against the heads of the femur and tibia; as, for example, when a person receives a kick from a horse, or falls from a great height upon his knee. I remember it happening thus:—A coachman in the act of pulling up his horses, broke the foot-board on which he pressed with his whole weight, and fell from his box. In his fall he struck his knee against the roller bolt, and fractured the patella into several portions. In such a case there is not only a fracture of the patella, but there is also a violent injury of the joint combined with it, and the importance of the distinction is evident from this,—the treatment, which if pursued in the one case may be perfectly proper and successful, if followed in the other may be attended with the loss of life. But there is, besides, another reason; there is a prospect in the one case of the broken portions being united, merely by means of ligament, while we may expect in the other, by proper management, to procure union by bone.

In the common fracture of the patella, we observe an appearance of unnatural flatness, and squareness of the fore part of the knee, which is very peculiar and characteristic of this injury; when once it has been observed, the appearance can scarcely in future be mistaken. This squareness is occasioned by there being certain points of bone brought nearly upon the same level; the patella being transversely divided, its upper portion is drawn away from the lower, and thus the usual prominence in the centre of the knee is destroyed; the fractured portions, now occupying the upper and lower parts of the joint, appear as projections there, while the two condyles of the femur jut out on each side unnaturally, and a square flat surface is produced, bounded by these projections of bone. In placing the hand upon the knee, the four knobs of bone which constitute this peculiar squareness can be felt, and the sensation conveyed makes it quite clear what the nature of the accident is.

This kind of fracture of the patella is most frequently caused by the person stumbling, and then making a violent effort to recover his balance. He suddenly brings the quadriceps extensor into powerful exertion, and the force of this muscle may be imagined, when we consider that it is capable of throwing up the whole body as in a leap: it is this muscle too which straightens and then fixes the limb, when we rise up under a heavy load placed upon the shoulders. We can, therefore, imagine, that in making a violent convulsive effort,

when the body is thrown off its centre of gravity, this muscle may act with force sufficient to rend the patella asunder. But there is another circumstance which renders the liability to fracture greater; there is a certain degree of flexion of the knee-joint, during which the patella is more easily broken. About the middle state between extreme flexion and extension of the limb, the patella rests with its upper half upon the convex surface of the femur, while that part of the bone to which the ligament of the patella is attached, projects without support over the space left between the separating surfaces of the femur and tibia. If the knee-joint be further bent, and the quadriceps muscle be in a state of spasmodic contraction, thus retaining the patella fixed upon the end of the femur,—and if the ligament of the patella be acting in an angular direction upon the projecting part, the bone is then snapped, as it were a stick broken across the knee.

Sometimes in cases of fracture of the patella, which take place in this way, we find there is a confusion in the statement of the patient. When asked how it happened, he is at a loss to make out whether the bone was broken before he fell to the ground, or whether his fall caused the fracture. But it is not unfrequent that intelligent patients, of their own accord, state distinctly that they heard a snap at the knee-joint when they were making a violent exertion, and immediately after that they found they were lame, the knee sinking under them. It is a remarkable circumstance attending this accident, that when a patient has once suffered from it, he is very liable to have the patella of the other knee fractured. Now it is quite unnecessary to attribute this to the patella of such a patient being of a very brittle texture,—an explanation that has been offered. This is exceedingly unsatisfactory, and we may explain the circumstance on another principle, namely, the lameness and inperfection of the limb consequent upon the previous injury. In all probability, when the fractured patella has united, there has been a considerable space intervening between the portions, and the interval has been filled up with ligamentous substance. This, it may be perceived, is but a poor substitute for the perfect structure of the patella: the office of the patella is nearly destroyed, for the ligamentous part plays upon the surface of the femur, nearer the centre of motion, and, consequently, the muscles lose somewhat of their lever power. The individual is, therefore, apt to trip frequently, and, consequently, he is very often called upon to make those violent exertions to save himself from falling, which it has been shown are the most likely to endanger the patella. It is thus he incurs the risk of rupturing the patella of the sound limb from having already had a fracture of the other. It is not improbable, however, that there may also be some peculiarity in the form of the projecting part of the patella, which may render its fracture more likely to occur in some persons rather than in others.*

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*We have heard Mr. Bell state, in other courses of his lectures, a

The next question presented for our consideration is, What is to be done? Is the bone to be set, and the knee bandaged? There will be many occasions for our remarking the impropriety in all kinds of fracture of bandaging the limb immediately after the accident has occurred; we must delay until the attending inflammation has been subdued. In reference to the accident we are now considering, this is a part of the subject of high importance, and one which ought to be well understood. Some years ago it happened thus:—there were four cases of fractured patella admitted into the hospital, nearly all at the same time, or in quick succession, and great satisfaction was derived from the success which attended them; but at last a man was brought who had fallen from a height, and shattered the patella by striking his knee against a projecting point. The young gentleman who had the charge of all these cases, being satisfied with the practice which had proved so successful in the former instances, thought that he would do right in pursuing the same treatment in this one also. Seeing the good effects of bandaging, and not having sufficiently studied the difference of the case, he applied a bandage the very day that the patient was admitted into the hospital. The effects were but too obvious on the first view of the surgeons; the pain, swelling, and inflammation, were excessive, and—not to dwell on an unfortunate occurrence—not the limb only but the life was lost.

I am satisfied that you will make the proper use of this case. Although it happened in this hospital, yet I am bound to relate it for your instruction; it conveys an impressive lesson, and should make us consider well the difference in the nature of the various injuries by which the patella may be fractured. In a case of this kind, when there has been a violent blow upon the knee-joint, inflammation will continue for a much longer time than when the bone has been simply broken by the action of the muscles. In the case of David Keith, it is mentioned that an attempt was made to bandage the limb, but it

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case which proves how cautious patients ought to be after the patella has been fractured. A patient was dismissed from an hospital with the portions of the patella united by a long ligament. Whilst he was carrying a burden on his head, he slipped, and the joint yielding, the whole anterior part of the knee was rent open and its cavity exposed, so that it was necessary to amputate the limb. He used to state this case as a reason why, on dismissing patients from the hospital, he ordered a splint to be put behind the knee-joint. It also affords a reason for endeavoring to bring the portions of bone as close as possible; when they are far apart, the integument is consolidated with the ligamentous substance, it loses thereby its elasticity, and the above accident may take place. Mr. Bell has suggested in these cases of fractured patella the use of the seton. When the cure has produced so far as to close the joint by a newly-formed membrane between the broken bones, he conceives it practicable to pass a seton between them, without penetrating the joint. If at the same time the portions of bone be pushed into close contact, there may be produced union, either by ossific matter, or by a short and condensed ligament.

had to be desisted from, on account of the patients complaining of pain. But let me repeat, when the patella is broken by a direct blow, there is not the same separation of the portions of the patella, which occurs in the common cases; the blow breaks the bone, but still the strong fascia which covers the knee-joint, and is fastened to the patella, is entire, and prevents the splinters from being detached far from each other. In one case the patella was fractured into five different portions, yet they were all agglutinated and supported by masses of coagulable lymph, which in some parts had become ossified; this shows that there need be no anxiety about applying the bandages too early.

Bleeding and cold evaporating lotions, with all the antiphlogistic means, are first to be used, to subdue the inflammation. After this the bandages and pads may be applied so as to approximate and give support to the pieces of bone. Care is to be taken during the whole treatment to keep the leg in an extended posture: in the first place, to prevent a wider separation of the portions of the patella before the proper bandages can be applied, and because we cannot expect to bring the detached pieces close together, unless the muscles, which have a tendency to draw up the patella, are relaxed. The patient's body must be raised in bed, and he must have a bed-chair to make him sit up; or, if he grows weary of this position, attention must be paid to elevating the extended limb whenever he lies down, raising the heel by pillows, for the purpose of causing the knee to approach the pelvis, that the rectus extensor cruris may be relaxed.

It has been said that we should not try to unite this fracture by bone, and the fact that ligament is commonly the bond of union in fractures of the patella, has been regarded as a beautiful provision of nature for protecting the joint. If ossific union took place, then the patella, it has been argued, would present a rough, unpolished surface to the smooth articular cartilage of the joint, and might thus injure its delicate structure. But we need have no dread of bony union producing this mischief. I have examined, after death, four cases of fracture of the patella, consequent on direct blows received upon that bone, in which were exhibited the several stages of ossific union. They each proved that the roughness existed only on the outer surface of the bone. The specimen, which is now brought for your inspection, exhibits the pieces of bone attached closely together; and still they present an uniform surface internally, while externally, they are surrounded with masses of coagulable lymph, and of bony deposition, just as in fracture of the long bones. It is, therefore, the rule of parctice in all cases, to bring the broken portions exactly in apposition:—in the one case, with the hope of attaining ossific union from the bones being placed closely in contact with each other, or if we do not succeed in that, at least we may obtain a very short interval occupied with ligament; on the other hand, if it has been a case of fracture produced by a kick or a blow on the knee, then we may probably have success, similar to that in the case of Keith, in which we find the bone

is compact, and the motion of the joint free. Several other patients have been dismissed from this hospital, in whom there has been the same reason to conclude that the union by bone had taken place.

There is a question at present much agitated among the senior members of the profession.—How comes it that the fractured patella is so seldom united by bone, and so frequently through the medium of ligament? In explanation of this we are led to consider what occurs when one of the long bones is fractured. If the humerous or femur, for example, be broken, it implies that there is great injury committed to the whole mass of flesh that surrounds the bone: it is bruised, and extravasation of blood is the consequence: the fractured ends of the bone also lacerate the surrounding textures; the blood is in this way permitted to lodge close upon the surface of the bone. Then tumefaction of the whole limb takes place,—inflammation is set up, and the blood, which was effused, undergoes a change in process of time, and coagulable lymph is substituted in its place; consolidation of the surrounding cellular membrane and periosteum proceeds gradually to make the limb firmer: there is adhesion between the two fractured ends, by means of this condensed mass, which is found fixed to the bones: this coagulable lymph gradually is converted, first into a substance of a cartilaginous hardness, and finally into true bone; spicula of bone having grown within it, they coalesce, so as to produce solid union. It appears that this great and extensive injury, this effusion of blood through the cellular membrane, this tearing of the flesh, and the consequent swelling and inflammation of the limb, all of which we might consider as disastrous, are essential for the reunion of broken bones. When we next contemplate what takes place during the fracture of the patella, produced by the action of the muscles, we perceive that there is a great difference in the circumstances. The bone has been snapped across without any corresponding injury being inflicted on the soft textures; the degree of violence is not considerable, the tumefaction that ensues is seldom very great; there is scarcely any ecchymosis. Thus there appears not to be sufficient injury inflicted for producing union by bone. We may observe the same thing when the olecranon has been fractured; or when the neck of the femur has been broken within the capsule. This last mentioned accident has given rise, it is well known, to much discussion among the most eminent of our profession. An explanation of the fact is sought, why in fractures of the neck of the femur, the union is commonly by ligament instead of by bone. It is not altogether from the difficulty of keeping the parts in apposition, that this is to be explained. In cases which I have examined after death, where the bone was fractured within the capsule, I have discovered that a thin membrane alone intervened between the portions, showing how nearly the parts had been kept approximated, yet, after all, they were not united by bone. Some other method must be used to account for the fact. The same reasoning which has just been applied to explain the want of

ossific union in cases of fractured patella, may be employed here also. If the neck of the femur be broken across at its thin cervix, which is enclosed in the tough capsular ligament, the extent of the injury is very limited. There may be, perhaps, an increased secretion of the synovial fluid of the joint, but there are no cellular connexions torn up, into which the blood may be effused, and by which the broken ends of the bone may be surrounded, as in other cases; the fractured extremities are not supported by the consideration of the neighbouring parts, nor sustained by the same mass of inflamed structure, which is always found when the long bones are fractured at their centre. This appears to afford an explanation of the extreme rarity of union by bone in the case of fracture of the neck of the femur. A certain degree of violence seems essential for producing ossific union; and the neck of the thigh-bone included in its natural capsule is protected from receiving that degree of injury. A difference in the circumstances is attended with a difference in the results; for when the fracture occurs externally to the capsular ligament, then union by bone takes place. The splitting of the bone is attended with laceration of the neighbouring parts; blood is effused, and inflammation, with condensation of the surrounding muscles, are the consequences. To this point we shall recur when an opportunity again presents itself.

ART. IV. *Observations on Expansibility as a Vital Property, and on the Influence of the Capillary Tissue over the Circulation of the Blood.* By HUGH L. HODGE, M. D. *Lecturer on the Principles of Surgery in the Philadelphia Medical Institute.*

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Notwithstanding 200 years have elapsed since the discovery of the circulation of the blood, that great and sustaining function of the animal system, is far from being thoroughly understood. We know, with the immortal Harvey, that, in man and the other mammalia, the blood is projected from the left heart, into a common conduit, which ramifies indefinitely; that it is received into the veins and returned by two trunks to the right heart, whence it is thrown into another arterial trunk, and again received from its ramifications by four veins, and restored to the cavities from which it first issued—having completed the tour of the whole body. Of the structure of the hydraulic apparatus, by which this *unique* circulation is effected, we know something—indeed, a great deal—but we do not know the whole. The *cardiac* portion consists of parts which can be seen and examined, but the *capillary*, are minute, intangible, in a great degree invisible, and constitute, in many of their parts, a kind of *terra incognita*. Having but a partial acquaintance with the anatomy of the circulation, it is not wonderful, that our knowledge of its physiology, should be imperfect;—for a machine must be surveyed in all its parts, before its mechanism can be understood. But the *modus operandi* of the central parts, themselves, is not yet fully revealed—notwithstanding the descriptive anatomy of those parts has, for ages, presented an aspect of great perfection. For example, it is still uncertain in what manner the cavities of the heart are dilated; and how far that organ

performs the office of a sunction pump, upon the columns of blood in the great veins; or how its action, united with that of the larger arteries, occasions their pulsation. If doubts rest upon the physiology of that structure, which is well understood, the functions of that which is nearly unknown, must be enveloped in obscurity. Hence, there have been many "vain imaginings," as to the manner in which the small vessels receive, transmit, and vary the distribution of the blood. Of the opinions, which may be regarded as deductions from fact, there are two, which divide the physiological world. First, that the capillary vessels have a constant contraction, which tends to diminish their diameters and to resist the action of the heart; which, however, possesses such relative force, that the lateral contraction of the capillaries operates, of necessity, to push the blood forward into the veins. Secondly, that the capillaries, like the heart itself, alternately dilate and contract; thus receiving blood from the larger trunks by a suction, which co-operates with the *vis a tergo* impressed by the heart, and sending it forward into the veins. Either hypothesis may, perhaps, explain the phenomena of the circulation, when it is *in equilibrio*, but such a state is rather imaginary than real; for a perfectly equable distribution of the blood throughout all the organs, that is, a condition in which all the vessels are, simultaneously, filled to the same degree, in proportion to their capacities, does not, in fact, ever exist. The vital fluid is never equally distributed; but is found accumulated, successively, in all the organs and tissues of the body, according to the excited state of their functions. Now, no theory of the capillary circulation, that will not explain these physiological and pathological determinations into the different organs, and the consequent disruptions of the balance of the circulation, should be regarded as true or useful. To explain them by a reference to the actions of the heart is impossible; seeing that the blood is thrown by that engine into a common trunk; and, therefore, that the capillaries are all fed from the same fountain, and, of course, affected in the same manner, by the changes which it undergoes. To the capillaries, themselves, must we look for, the power which

draws the blood into one organ, and withdraws it from others. But, on the first hypothesis, how can they do this? They do it, we are told, by doing nothing; that is, by contracting with less energy, in a particular organ, whereby, that organ suffers accumulation, from the general pressure of the vascular system; which directs the blood towards the weakest part—just as in any system of elastic tubes filled with a fluid, the one which is weakened will of necessity become distended. Every case of local plethora has, then, for its proximate cause, reduced power and contraction of the capillary vessels, in which it occurs. Now, this plethora is of two kinds, that which occurs in organs, when acted on by their specific stimuli, and thrown into the orgasm necessary to the performance of their proper functions; and that which results from abnormal irritation and constitutes disease. One of these, however, is natural and healthy, the other unnatural and morbid; and to refer them to the same condition of the same function—that of contraction—is to violate one of the soundest rules of philosophical logic. Moreover, it seems incredible, that the proximate cause of the high excitement which organs exhibit, when performing their functions, should be a state of debility.

We have, therefore, long been disposed to prefer the theory, which assigns to the capillaries an active agency in disturbing the equilibrium of the circulation; and in attracting increased quantities of blood, into particular parts; and have even ventured, when attached to the medical department of Transylvania University, to adopt and inculcate the opinion, that they possess dilatability, as well as contractility. To support this theory, is the design of the essay of which we now proceed to speak.

In the following paragraph, our author sets forth the object of his inquiry:

"All physiologists agree, that capillaries have the vital property of contractility, that they contract on the application of certain stimuli, and that the result of this contraction is the expulsion of their contents. The object of this paper, however, is to show, that capillaries have a vital property of expansibility,—that they dilate under

the influence of certain stimuli, and that the effect of their dilatation is to draw blood into their cavities from the supplying arteries, and thus materially to facilitate the motion of this fluid in the large as well as in the small vessels. The facts to be presented in support of this opinion, will render it at least probable, that expansibility is a property, not only of the capillary tissue intervening between arteries and veins, but of all capillary vessels,—of the radicals of the veins, lacteals, lymphatics, and ducts of glands, and that it is possessed in a slight degree by the heart and arteries, also, as well as by the tissues confessedly erectile, as the penis, nipple, iris, &c." p. 3.

In the succeeding paragraph, he reasons with those who think, or suppose they think, that it is more difficult to form an idea of expansion than of contraction, in living tubes; and declares, with justness, that the latter is, in fact, as remarkable as the former. He then tells us that expansibility, as a vital property, is not a new idea, but was held by Bordeu and Hunter, and has lately found many advocates in Europe, and the United States. His object seems to have been, to embody all the known facts in support of that opinion, and these he has arranged under the following heads:

"The points to be discussed will all be embraced in the three following propositions, which I shall endeavor to sustain by facts and arguments.

"I. The capillary and arterial tissues do not dilate passively from a vis a tergo, derived from the heart and arteries.

"II. Some tissues possess expansibility as a vital property; that is, are capable of expanding under the influence of certain stimuli. This property is possessed most remarkably by the capillary system intervening between the arteries and veins, and by the radicles of veins, of the absorbents, whether lacteal or lymphatic, and of the excretory ducts of glands. That it also exists in the heart and arteries, perhaps also in the veins and the ducts of glands, as well in those structures denominated erectile, as the iris, penis, nipple, &c.

"III. The circulation of the blood in the arteries is powerfully aided by this dilating power of the capillaries, drawing the blood into their cavities; and this power of the capillaries is the almost exclusive agent in all increased local determinations of blood.

"IV. During the activity of inflammation, an increased quantity of blood flows through the affected part." p. 5.

In support of the first proposition, he cites many acknowledged and familiar facts; of which we consider it unnecessary to extract more than a single group:

"Contusions, when so severe as to paralyze the vessels without destroying their vitality, leave a part pale for a longer or shorter period according to the violence of the blow. BOYER, in his Surgery (tome i. p. 105), notices several cases of local asphyxia from blows, "in which the heat, the sensibility, the movements, the pulsations of the arteries, in fine, all the phenomena of life, after having been apparently annihilated for many days, gradually returned and resumed all their former vigour." He cites from DE LA MOTTE the case of a boy whose right hand was completely paralysed by a blow with a billiard stick, received on the outside of the forearm; "the hand, for ten days, appeared to be dead; but at the end of that time the heat gradually returned, the beating of the arteries became perceptible, and the hand was restored to its natural condition." How can the supposition of passive dilatation be consistent with these facts? The vis a tergo from the heart and arteries, was perfect; other parts of the capillary system are dilated; but those vessels, whose powers are most exhausted, instead of being most dilated as they would be, if the theory were true, are the most constricted." p. 6.

The second proposition, that *some tissues possess expansibility as a vital property; that is, are capable of expanding under the influence of certain stimuli*, has received a great share of our author's attention; and is sustained by an array of facts, too well ascertained to be rejected, and too pertinent to be easily explained away. He begins, by referring to the acknowledged existence of erectile tissues, as first pointed out by Bordeu, and offers reasons for ascribing the 'expansile power to the vascular system.' We believe with him, that it belongs to that system, and resides in the nascent veins as well as ultimate arteries. We believe still further, that it is universal, in other words, belongs to *all* the minute vessels, but is greater in some than others; being proportionate to the physical necessity which may exist in different organs for copious, occasional supplies of blood.

In the first place, our author considers this property as appertaining to the absorbents, without which, he thinks, we cannot explain the function of absorption.

Secondly, he treats of it as a quality of the sanguineous capillaries; and the whole section is worthy of an attentive perusal; but we must limit ourselves to the following extracts:

"Certain stimuli or irritants are immediately followed by an enlargement of the capillaries; there is no evidence of prior contraction and subsequent exhaustion.

"Caloric is a universal stimulus. When a portion of the cutaneous tissue is immersed in warm air or warm water, an immediate distention of the capillary vessels is observed. This dilatation by the stimulus of heat is as immediate as the contraction of a muscular fibre from any mechanical irritant; the one is as direct an effect as the other. There is no evidence of exhaustion or debility of the capillary vessels; for all the phenomena peculiar to life are augmented, such as heat, scarlet redness, circulation, and secretion. Neither should the effect be attributed to an increase of the vis a tergo; for, 1st, The enlargement of the capillaries occurs before the excitement of the supplying arteries; 2d, It is often great when there is no evidence of increased action of the larger vessels; and 3d, Such dilatations may often be excited by caloric, when the actions of the heart and arteries, including the supplying arteries, are exceedingly depressed. In all cases of prostration, where the pulsations of the heart and arteries can scarcely be perceived, where the surface is cold and pale, and all the organic vital phenomena are greatly diminished, warm applications are always resorted to; and when they redden the skin and produce inflammation or vesication they are advantageous. Where, in such cases, is the vis a tergo to dilate the capillaries? or what reason is there for imagining that the effect of the stimulus on these pale, bloodless, and weakened vessels, is to contract them, and thus to exhaust their power that they might yield to a vis a tergo? Further exhaustion would be death, which caloric, as every practitioner knows,would rather prevent than accelerate.

"These remarks respecting caloric may be extended to most other irritants. The puncture of a needle or the sting of a wasp, is immediately followed by redness; a mote under the eyelids instantaneously causes an enlargement of the vessels of the conjunctiva; a drop of nitric acid reddens the skin, and so of other irritants. In none of these cases is there evidence of contraction preceding dilatation; or of exhaustion directly or indirectly produced.

"Internal stimuli often enlarge the capillaries without any evidence of an increased vis a tergo. How instantaneous is the appearance of a blush, mantling the face and neck from the operation of certain passions. The enlargement of the small vessels, in blushing, is the result of a nervous irritation, not of increased action of the heart; for, 1st, This viscus is often undisturbed: 2d, In all instances the blush is partial; if owing to the contraction of the heart it would be universal: 3d, in violent palpitations and other increased actions of the heart, the capillaries are not distended as in blushing, but are often remarkably contracted. Their enlargement, as well as their contraction, must depend on inherent powers.

"The remedial agents, which increase the diameters, as well as the functions of capillaries, without augmenting the action of the heart and arteries, in other words, the vis a tergo, are very numerous. To this head must be referred most of the diaphoretics, diu-

retics, expectorants, and cathartics. Mercury also will often produce local dilatations, secretions, and even inflammations of the skin, gums, tongue, and salivary glands, without any evident excitement of the general circulation. In such cases, is not the hypothesis unfounded, which maintains that the vessels, thus acted on by internal stimuli, and having all their vital phenomena increased, must be debilitated before they enlarge?

"Even the dilatations of capillaries from the diffusible stimuli, wine, brandy, &c. which do disturb the heart and arteries, cannot be owing to a mere mechanical impulse; for, as already hinted, the enlargement is often in an inverse ratio to the vis a tergo. Thus, when the action of the heart is violent, the capillaries are often undistended; and their distention is often very great when the cardiac pulsations are languid.

"Again: Whenever any excitement is manifested in the functions of a tissue, organ, or apparatus; or when any new or increased demand is made on such tissues or organs, the capillary vessels dilate to meet the emergency.

"Compare the different conditions of the capillary system in childhood and old age. In the former, all is activity, not only to replenish the various secretions and excretions so abundant in infancy, but especially to furnish the materials for growth. The capillary system is full and tense. In old age, the phenomena of life are diminished, nutrition and secretion are lessened; while wrinkles and emaciation are substituted for the fullness and tension of a prior stage of existence. The same difference is observed in the peripheral system of infants when in health and when diseased; and of the extremities before and after the occurrence of paralysis. Where the phenomena of life are most displayed, the capillaries are most developed; where they are diminished, these vital tubes are proportionally smaller. Surely, in the former case, they are not debilitated and passively dilated.

"The same remarks are applicable to all *general* excitements of the capillary system. Are not the vital energies in greater exercise, and the capillaries, at the same time, more dilated in an inflammatory fever than in a typhous fever, or in hectic wastings; during the ruddy excitement of health than during syncope; in the hot than in the cold stage of fever; during the stage of reaction than in that of collapse from concussion of the brain; when under the influence of heat than of cold; while the individual is burning with anger than when torpid with fear? That the capillaries in these and similar cases are not distended by an increased energy of the heart was proved in our first proposition.

"The same enlargement of the capillaries is observed in all cases of *local* excitement: cases in which no one contends that there is a diminution of any of the vital phenomena. The capillary vessels are enlarged in the growth of tumors; in tissues or glands for their increased secretion, whether temporary or continued; in the heads

of animals which are renewing their horns; in the organs of generation of those female animals which are in season; in the brain and face, during excitement from moral or physical causes; in the uterus after conception, and even before the descent of the ovum; in the iris, nipple, and penis when appropriately excited. In none of these cases is there any evidence of exhaustion of power or an increased vis a tergo. In all, the manifestations of vital energy are increased.—pp. 14.

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"During the acute stages of inflammation, the parts are very tense and hard; and moreover, when such parts are covered by any unyielding membrane, as hardened cuticle, fascia, periosteum, &c, the phenomena of inflammation are greatly enhanced, and the progress of the disease to suppuration or gangrene is hastened, while the fascia or membrane becomes very tense. Whence the distending power in such cases? Is it intrinsic or extrinsic?—Not extrinsic, because 1st, The distention is not proportioned to the excitement of the heart and arteries; being often great when this excitement is at the healthy standard, and sometimes even when the general circulation is greatly depressed. 2d, If the swelling and tension were owing to a vis a tergo, the resistance of the membranes, so far from aggravating, ought to cure the inflammation by restoring the equilibrium between the resistance of the small vessels and the vis a tergo. The passive distension of the former would be effectually resisted and the balance restored, which, according to the seductive simplicity of the *mechanical hypothesis* of Dr PHILIP, is the only desideratum in the treatment of inflammation. Hence Dr LUCAS, one of his disciples, recommends pressure as one of the most powerful remedies for this disease; but every practical man knows the mischief produced by pressure from bandages, ligatures, tendinous sheaths, fasciæ, &c. during the acute stages of the phlegmasiæ; for, 3d, We find that the removal of pressure moderates the symptoms, shortens the disease, and facilitates resolution. Hence one advantage derived from fomentations and poultices in superficial inflammations in softening the indurated cuticle; hence the necessity for dividing in a transverse direction the tendinous sheath in paronychia and the fibres of faciæ during sub-aponeurotic inflammations. Relief could not be afforded by such measures, if the dilatation were passive; for the vis a tergo being increased and the capillaries being debilitated, the distension would continue augmenting until rupture or mortification should ensue.

"This objection alone, I regard as sufficient to overthrow the whole hypothesis of our opponents. When inflammation disappears, they say the balance is restored between the capillaries and the supplying vessels,—the disproportion between the resistance and the vis a tergo having ceased; but how can this ever occur spontaneously, that is, without the interference of the surgeon. The more the palsied capillaries are distended, the more incapable are

they rendered of resisting the impetus from the supplying vessels. How then is the supposed necessary balance restored? How can the capillaries recover sufficient energy to resist an impetus, which, on their supposition is continually increasing? Rupture or gangrene we should imagine must be the result of every inflammation, in which art does not interfere with its pressure or its astringents.

"The distending power not being therefore extrinsic, depending on a vis a tergo, is *intrinsic*, and its exercise is the result of irritation. For experience shows that when the irritation is removed, the tension disappears: the same capillaries exposed to the same increased vis a tergo, will often diminish in size on the removal of the cause. Remove a mote from the conjunctiva, or a splinter from the skin, and the enlarged vessels are lessened, and the inflammation is resolved, notwithstanding the excited condition of the supplying vessels. On the contrary, the increase of irritation is necessarily followed by a more violent inflammation; its phenomena becoming more intense in proportion to the severity of the irritant, until the vital powers of the part become exhausted and gangrene ensues. Irritation, therefore, and not the vis a tergo, is the cause of the tension of inflamed parts. This irritation is generally increased by pressure, which hence aggravates the phenomena and accelerates the progress of inflammatory affections.—pp. 16—17.

In the third place, he enquires into the expansile power of the larger arteries, which he believes to have an existence, but in a less degree proportionably, than in the capillaries. In proof of this branch of the subject, he relies chiefly on pathological facts, most of which are familiar to the profession. We shall, therefore, pass over them, to lay before our readers, his comments on the experiments of Dr. Parry and Mr. Hastings, whose works on the Pulse, and on Bronchitis, are but little known in this country.

"Numerous experiments upon blood vessels made by distinguished physiologists, with other objects in view, prove the expansile power of arteries. I shall quote facts from two authors only, each of whom maintains opinions opposed to those which I am advocating. Mr Caleb H. Parry,* in his 23d experiment, after having exposed and carefully measured both carotid arteries, tied one vessel: the other increased in size. When this was also tied, it resumed its original dimensions; proving that the previous distention was not owing to a vis a tergo. To this conclusion, Parry himself was led; for he maintains as the result of numerous experiments, that the arteries are always during health distended beyond the size to which

*Parry on the Pulse, Ed. 1816.

their elasticity would bring them (p. 69); and moreover, that this forced distension of an artery does not depend on the impulse of the blood from the left ventricle, (p. 71). This distension, he observes, is increased in local determinations of blood; and as it does not depend on the elasticity of the arteries, nor on the systole of the heart, "we are compelled to admit as the cause of the common dilatation of the larger arteries, and still more forcibly of that which is preternatural, the mechanical distending power of the blood which they contain."—p. 78. This explanation, however, is unsupported by facts; and it would be difficult to conceive how the blood, when in rapid motion through the arteries, could mechanically dilate one vessel and no other, unless some change previously occurred in the parietes of the tube.

"The second author to whom I refer for facts, is Mr HASTINGS,* who, after many and diversified trials, asserts that mechanical and chemical irritants applied to the larger arteries will often excite contractions and dilatation of the vessels in the part irritated. "This increase of motion did not arise from any modification of the heart's action; for the degree of dilatation and contraction in the unirritated part of the vessel nearer the heart was unaltered"—p. 26. Neither is the dilatation owing, as Mr HASTINGS would seem to intimate at page 31, to a diminution of irritability or to a suspension of power, for contraction would then be suspended instead of being augmented; nor to relaxation after prior contraction, for such alternate relaxations and contractions do not occur in muscular fibres (those of the heart alone excepted, to which we shall presently allude) when mechanically or chemically irritated. A tonic contraction exists, so long as the irritant is operative. The increased pulsation of arteries under the direct influence of stimuli, is, therefore, but a more clear manifestations of their normal actions;—dilatation being the result of stimulation as evidently as contraction. This is a very fruitful subject. It embraces all questions relative to the causes, nature, and varieties of the pulse, and admits of numerous illustrations. But the facts already adduced, taken in conjunction with the well known varying condition of the pulse in cases of sedation or diminished excitement of parts, as well as in those of irritation, prove that its condition, as to size, tension, and strength, does not depend solely on the systole of the left ventricle, but, at least to an equal extent, on the degree of excitement in the arteries; and that the actions of the arteries are greatly influenced sympathetically by the ever-varying conditions of the capillary tissue to which they are distributed. The formation of the pulse depends on the heart; but its size and tension, on the degree of excitement existing in the arteries and capillaries, so long as there is a free supply of blood.—pp. 20—22.

*On Bronchitis, London, 1820, p. 24, et seq.

Lastly, he comes to examine into the expansibility of the heart, which he believes to be real; and shows that many physiologists have agreed in its *existence*, while they disagreed as to the *mechanism* by which its dilatation is effected. Without citing proofs of that which is so unanimously admitted, we shall conclude our notice of the second proposition, by quoting his final remark.

"The heart would hence appear to possess an active dilating power, exercising a slight suction influence over the blood in the large veins near this organ, and thus facilitating, instead of opposing the ingress of the blood. Evidence, I think, is yet wanting to prove, that any part of the circulatory apparatus, during its healthy condition, resists the motion of the blood. Each portion co-operates, and beautifully harmonizes with every other portion, in carrying the vital fluid through the circulation,—an idea to be further illustrated in the ensuing proposition.—p. 23.

His third proposition is, that 'the circulation of the blood in the arteries is powerfully aided by this dilating power of the capillaries, drawing the blood into their cavities; and this power of the capillaries is the almost exclusive agent in all increased local determinations of blood.'

In verification of the two members of this proposition, he has accumulated a great body of facts; though as he justly remarks, if the preceding propositions are true, this must flow from them as a corollary. In the first place, he surveys the circulation of the sap in vegetables, and finds abundant evidence, as he thinks, of the existence in them of a power of suction, dependent on the expansibility of their vessels. We have room to extract but a single paragraph:

"The sap ascends when the trunk and branches are subjected to the influence of a warm atmosphere; but it remains in the root when such stimulus is not applied. It is manifest, that the caloric, in such cases, operates on the superior or exposed portions of the plant; the roots, buried in the soil, being comparatively unaffected by atmospheric variations of temperature. Examination proves, that parts thus stimulated swell, and, from a comparatively dry state, become moist and suculent; in other words, that the vessels dilate under irritation, attract or suck in the nutritious fluids, whence result leaves, buds, blossoms and fruit. There is no vis a tergo to distend the

whole peripheral system of vessels, and in such textures, dilatation must precede the entrance of fluids.—p. 24.

Passing from plants to animals, he presents us with various appropriate observations, of which we shall transcribe the following:

"Dr PHILIP and Dr HASTINGS* state, that in live dissections, the circulation in the smaller vessels will continue for several minutes after excission of the heart. In the mesentery, Dr PHILIP has observed that the circulation proceeded with regularity for half an hour after the removal of the heart†. If contraction were the only vital action, the blood would be driven out of the small vessels; and as no vis a tergo existed from the heart, their dilatation could not occur, but the vessels would remain collapsed and the part bloodless, as in syncope and local asphyxia. Professor HORNER also informs us, that during live dissections, the capillary vessels remain distended, after the heart has ceased to act, and so long as any blood remains in the arteries,—the larger vessels becoming first empty, then the smaller ones, and finally the capillary tissue.

"These phenomena cannot depend on mere vital contraction of the vessels: for such contraction would occur more readily in the capillary system, the irritability of which is greater than that of the arteries; and this contraction would not, as shown in Proposition I., be overcome by the vis a tergo from the contraction of the arteries. Hence, the influence from the heart being removed and the capillaries contracting, the blood would remain in the arteries, on the supposition that contractility were the only vital property. But the arteries are found empty before the circulation has entirely ceased in the capillaries, and while these last remain turgid. The capillaries hence manifest a dilating power, drawing blood into their cavities, and assisting the arteries in discharging their contents. This being effected, the contractile powers of the capillaries throw the blood eventually into the venous system where it remains. In this way, I think, the emptiness of the arteries after death may be satisfactorily explained.

The above explanation is confirmed by attending to those few cases in which the arterial system remains distended: as when death has been suddenly caused by some powerful impression, as by lightning, a blow on the stomach, &c. Here the whole of the circulatory apparatus appears to be paralysed, and the blood is generally found fluid. No vascular action continuing after the cessation of the vis a tergo from the heart, the blood remains at rest.

Stimuli cause an afflux of fluids to the part irritated. In Proposition II. *g*, *h*, *i*, *k*, various examples were detailed to prove the

*Essay on Bronchitis, p. 51.
†Essay on Vital Fuuctions, 2d edition.

active enlargement of the vessels under irritations, in all such cases, fluids flow in increased quantities to the part. Whence this afflux? It is not owing to a vis a tergo from the heart and arteries, for this remains as before, and the capillaries are not debilitated (Proposition II, *g*, *h*, *&c.*) And even if they were debilitated, the part would not be distended by the vis a tergo (Proposition I.), and of course no increased flow could occur. The fluids are evidently attracted to the part irritated, and as dilatation must precede their entrance, I infer that such dilatation, excited by stimuli, is the immediate cause of all such local determinations of blood. This view is confirmed by the fact, that the afflux is proportioned to the irritability, and vascularity of the part and to the severity of the stimulus. They increase and decrease *pari passu*. The contraction of the heart, acting upon a single column of blood, can have no effect in increasing or diminishing the flow of blood to any tissue. Such local changes depend therefore, on local causes, and chiefly on the varying degree of excitement in each part.

"The influence of the capillaries, in drawing blood from the larger vessels is often exemplified in the operation of sinapisms, blisters, and other rubefacients in prostrated states of the system,—where the surface is cold and pale or lived, where the pulse can hardly be felt, and the phenomena of life are almost extinguished. What is the modus operandi of such remedies in exciting reaction? Do they first increase the vis a tergo, the actions of the heart and arteries, that the capillaries may be distended? or do they not primarily excite the torpid capillaries, whence dilatation and afflux of fluids, and afterwards secondarily and sympathetically, the arteries and heart? The last view seems correct, because such local irritations are often excited, when the arteries and heart do not sympathize; and in all cases, the capillary excitement precedes the general excitation.—pp. 27—29.

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"The rapid enlargement of the capillary and smaller arteries after the main artery of a limb has been tied was alluded to in Proposition II. *l*. The afflux of fluids to the cold and bloodless limb is no less evident than the dilatation of the vessels, and as the vis a tergo is diminished, while the redness and temperature are augmented, we must infer that the blood was moved by some other power than that derived from the heart and arteries; that the excited capillaries absorbed blood from the superior portions of the limb.

Dr. N. R. Smith, of the University of Maryland, records an interesting example of this kind*, in which a ligature was applied to the anterior tibial artery for a wound of this vessel. The hœmorrhage from the wound, and the pulsation of the artery on the top of the foot, ceased on drawing the ligature; but after some hours, the bleeding returned from the inferior orifice. The artery on the in-

*Philadelphia Monthly Journal, vol. ii. p. 18.

step now pulsated vigorously, the beat was stronger and more full in the wounded limb than in the other, and the blood, on experiment, was found flowing in a retrograde direction. The circulation here was more rapid by anastomosing channels than when the blood pursued its direct course.

"Professor SMITH was called upon to amputate the leg below the knee for a dry gangrene of the foot and ancle. The great arteries were found ossified, being mere tubes of bone. "Though all pressure was removed from the artery above, and no other means were used to suppress the hœmorrhage, yet not half a table spoonful of blood followed the operation. At the same time, the action of the heart, and of the arteries at the wrist, was vigorous."—p. 205. As no coagula existed in the arteries, and as the anastomosing vessels were not enlarged while the parts below had been supplied with some blood, it results that blood must have passed through these ossified tubes before the operation, and that its motion was not owing to the vis a tergo, as the open ossified tubes did not bleed when divided. Hence "the active power lost by the division of the arteries, resided in the capillary system of blood vessels of the foot and leg."—pp. 30—31.

Having, with these and many other similar facts, rendered it highly probable, that the capillaries, by their alternate dilatation and contraction, aid the heart in propelling forward the blood, he proceeds to say that, in many cases, they are, alone, adequate to the circulation. For the support of this assertion, he refers to comparative anatomy, and cites the invertebral animals which have no heart, and still maintain a vascular circulation, and to fishes which have a single heart only, and that devoted to the branchiæ or gills, leaving to the vessels, themselves, the responsibility of maintaining the systemic circulation. In man, he notices the portal circulation, which can receive no aid from the heart, except through the capillaries of the abdominal viscera. We have no doubt, however, that the hepatic capillaries are aided by the suction power of the heart and chest, especially the latter, the influence of which must be greatest immediately without its walls and floor, consequently, cannot, any where, be more efficient, than in that portion of the vena cava ascendens, which receives the hepatic veins. Omitting any further reference to the proofs by which he has sustained this proposition, we shall extract his concluding remarks:

"From the facts and arguments which have been presented for the support of the present Proposition, it results that the contraction of the heart and arteries is not of itself adequate to the propulsion of the blood; and that capillaries, possessing a dilating power, draw blood into their cavities, and thus assist the impetus derived from the heart. The combined influences, derived from the contraction of the heart, arteries, and capillaries, impel the blood forward into the veins, where further assistance is rendered by the contractile power of these vessels, and when near the heart, by the suction influence of this organ and of the thraox. All parts of the circulatory apparatus thus assist each other, instead of furnishing obstacles to the circulation of the blood, as maintained in the present systems of physiology.—p. 34.

Our author's fourth proposition, that, *during the activity of inflammation an increased quantity of blood flows thro' the affected part*, is sustained by a series of facts, which we regard as altogether conclusive. To our apprehension, indeed, all the phenomena of active inflammation indicate increased *transmission*, not less than increased *accumulation*. The scarlet hue, increased heat, augmented sensibility and size, turgescence of the veins leading from the part, when if, obstruction and stagnation existed in it, they should be comparatively empty, finally, the copious hœmorrhage which ensues from incisions, are signs, not to be misunderstood, of great activity, as well as great fullness of the vessels. In addition to facts of this kind, our author has cited many others which we must pass over, to present the deductions which he has made from them:

"The phenomena and consequences of inflammation thus evince the close analogy which exists between this morbid state and those various processes of the animal system, in which every one recognizes an increased circulation; such as the renewal of a stag's horns, the growth of tumors, the erection of the penis and nipple, the enlargement of the uterus, the distention of the mammæ, and the subsequent secretion of milk, &c. The one class of phenomena manifests as decidedly as the other all the evidences of capillary excitement, and of an increased flow of blood through the affected tissues.—p. 36.

Having travelled over the series of facts and observations which constitute the body of his essay, we shall finish our extracts, with his final conclusions:

"If the object of this essay has been attained, it results that expansibility is a vital property, as well as contractility, and that both are

modifications of the irritability of many modern pathologists; that the heart, arteries and capillaries, possess this property of dilating under the influence of their normal stimuli, but do not enlarge from any vis a tergo to which they are subjected; and finally, that they contribute by active expansion and contraction, at regular or irregular intervals, to the ready transmission of that vital fluid which is essential, not only to secretion and nutrition, but also to reparation.—pp. 36—37.

In bringing our notice of Dr. Hodge's paper to a close, we feel it but a duty to say, that it has merits of no ordinary stamp. It is true, that his fundamental propositions are not original; but they were not established; and, although, he has brought to their support, but little not already known, he has done that which entitles him to much praise. He has clearly set forth the doctrines of which he is an advocate, and concentrated upon them a greater body of facts and arguments, than any other writer with whom we are acquainted. These have been industriously, drawn from every available source, are accurately expressed, and logically arranged. Every page bears the impress of an acute and disciplined mind; enriched with the learning requisite to the undertaking, and capable of that profound investigation, which the subject of the essay so imperiously requires.

To say that his dissertation contains nothing objectionable, would be to bestow upon it the praise, which could not, in sober truth, be awarded to any professional essay extant; but we deal in no exaggeration, when we pronounce it highly interesting, and recommend it to the attentive perusal of all our American brethren.

## MISCELLANEOUS INTELLIGENCE.

### ANALYTICAL AND ORIGINAL.

1. *Ununited fracture cured by Compression.*—Dr. Thomas H. Wright, Physician to the Baltimore Alms-house Infirmary, in the 4th No. of the *American Journal of the Medical Sciences*, has published several cases, which go to exemplify and sustain the influence of Compression in cases of ununited fracture.

Case 1st. was that of a carpenter who fell from his scaffold and suffered an oblique fracture of the lower part of the tibia, a fracture of the fibula, and a projection of the end of the former bone through a ragged wound of the integuments two inches in extent. Three or four months after the accident, the bones were ununited and all signs of ossific orgasm were gone, Dr. W. then determined on trying pressure.

"The simple, efficient, and surgical mode of making pressure by the tourniquet, since successfully practised by Mr. Brodie, did not occur to me. A strong, soft, double napkin was passed under the leg, extending from below the ancle, to the head of the tibia, pad-compresses of suitable size, were laid, which, when braced by the general bandage, acted as counter-wedges on the line of fracture. The bandage or napkin first laid, was drawn firmly around the limb, and confined at short spaces; at first by large pins, and afterwards by tacks. It was thus made to give uniform support and a regulated pressure through the compresses on the line of fracture, and to adapt itself closely to the contour of the whole limb from below the ancle, sustaining the inferior fragment to the top of the leg. The principle, in short, was that of the laced stocking, modified to act especially on a definite point and space. The compressing bandage was inspected, and generally tightened twice a day, and always drawn as firmly as the patient's feelings would allow. The limb was kept extended and in splints, to maintain steadiness, and preserve the correct axis of the foot on the leg.

"The favourable tendency of this treatment soon became manifest. In ten days the chasm or interval of the edges of the bone along the line of fracture, was much diminished, the bones having sensibly approximated by absorption of the interposed deposit. After three

weeks the depression which had always marked the line of fracture, and extent of separation, was obliterated to the touch, and the ends of bone seemed in close contact. Now, too, the tendency to eversion of the foot was lost, and moderate lateral pressure on the foot did not cause any parting at the fissure. A further particular detail is unnecessary, perseverance in the course described, produced at the end of five weeks from its adoption, unequivocal bony union. At that period the patient could elevate the whole limb; flex, extend, and rotate the foot freely, without the slightest evidence of motion in the line of fracture. The splints were thrown off, but the compressing bandage directed to be worn less firmly applied for some weeks, and the patient admonished to avoid for the present throwing the weight of the body on the affected limb.

"The cure in this case became perfect, and when the limb was enough recovered to take its share of weight and motion, it was found to have shortened less than one-fourth of an inch. The man walks now without halting, and as firmly and well on one limb as the other. This patient was confined to bed nineteen weeks and two days; and it was six months from the accident, before the consolidation was sufficient to permit use of the limb in walking.

Case 2nd. was that of a man 60 years old. Both the bones of his leg were broken, and the tibia nearly projected through the skin. The fibula united, but no union of the tibia took place under the ordinary treatment. The patient had been intemperate; and, previously to the accident, the leg was in a state of chronic enlargement, from infiltration and thickening of the cellular substance. Under these unpromising circumstances,

"It was determined to try strict and continued pressure. With this intention, a roller was laid regularly from the toes to the knee. Over this was applied short splints, made of binder's boards cut to suit the outline of the limb, then macerated, that they might be made to adapt themselves intimately to the surface about the fracture. Those splints were laid, while pliable from wetness, on opposite sides of the fracture, and braced in their place, as firmly as could be borne, by a second roller, carried from the ancle to the top of the leg. Two latteral splints of the same material, not macerated, were next applied and secured at intervals by a few turns of a roller. These splints were sufficiently long to steady the leg, and prevent motion of the foot, the wood splints first used were laid aside, and the patient confined to bed, with the limb extended. An occasional change from the recumbent to the sitting posture, was allowed the patient; but he was altogether prohibited from getting out of bed or bringing the limb into use.

"An evident change in the relation and aspect of the parts, was observed in a fortnight after this course was instituted. When the

plan of compression was adopted, the superior fragment of the tibia projected so sensibly at the point of separation, as to cause much deformity by its remarkable prominence. At the end of two weeks, this projection was much reduced, and by the fourth week, the bone had regained its natural level; doubtless, by the influence of pressure on the deposited matter, which had occupied the interval between the fractured surfaces. The facility and range of motion at the fracture, were also lessened though still discoverable. The pressure, together with confinement to position, were steadily maintained for six weeks. The long splints were then taken off, and the patient permitted to put the limb to the floor, and, supported by crutches, to bring it cautiously into use. The roller and close splints were kept on some time longer.

"When the point of fracture was examined, some weeks after the patient began to use the limb, the part appeared very firm. No pressure, which it was thought proper or necessary to employ, whether directed immediately to the fracture, or by using the foot as a lever to rotate the limb freely, caused the slightest indication of disunion. In a month or six weeks after the limb had been brought into use, the patient threw aside all artificial supports, and walked as well as before the accident. There is no discoverable shortening of the leg.

Case 3. This was a fracture of the ulna. At the end of five weeks, not the least union had taken place.

"Pressure was resorted to in this instance also. A roller was laid smoothly from the fingers to, and some distance above the elbow. Short splints, of binder's board, were fitted to the interior and external surface of the limb, to afford sufficient lateral support, and were well secured in place by a roller. A long splint of binder's board, incurved, and adapted to the arm, was laid along its ulnar line, extending below the wrist to support the hand, and a shorter splint of the same material rested on the radial side, the two forming an external case for the arm, not quite close, or meeting at the edges. The splints were made to embrace the arm by straps at short spaces, which, particularly at and near the fracture, were drawn as tight as could be borne. A due degree of pressure was thus constantly maintained as long as necessary, and the result was satisfactory in this instance as in the preceding cases.

2. *Salivation from inhaling the breath of a patient labouring under that affection.*—We have taken some pains to ascertain the correctness of the following information, and feel compelled to receive it as true.

Mr. George Howard, of this city, in the year 1826, was requested to shave one of his friends, who was at the time a patient of Dr. Barnes and profusely salivated. Mr. H. found his breath extremely offensive, but was compelled to inhale it

for some time, as the operation was tedious. He was himself in perfect health, and subsequently took no medicine of any kind; but in three days, a sore mouth, a copious spitting, and a disagreeable breath, began to show themselves; and it was soon apparent that he laboured under a true and profuse salivation. Dr. B. saw him and found his breath highly mercurial. In a few days all the symptoms disappeared, and left him in his usual health.

I am aware, that a certain class of physiologists will insist that there is in this statement some mistake; but why should they? Rejecting all the accounts that were *formerly* published, relative to the discovery of mercury in the systems of those who had died after having recently taken its preperations, we have in our own times unquestionable evidence of their absorption; we have, also, conclusive proofs, that foreign substances are eliminated from the system, through the kidneys, skin and lungs. If mercury, which is slowly volatilized, at a heat below that of the human body, should be introduced into it, why may it not escape with the gaseous exhalations of the lungs; and if these, containing mercury, should be inhaled by another person, why may they not excite ptyalism? We know no reason why they should not; seeing that mercurial vapour when generated by heat in the laboratory, speedily salivates those who inhale it.

3. *Poisonous Expectoration in Phthisis.*—The following fact, although not of recent date, deserves to be recorded.

In the year 1802, Judge McMillan, of the neighborhood of this city, a few weeks before his death, from Phthisis Pulmonalis, informed his physician, Dr. Goforth, that when sitting at his door, and accustomed as he was to spit the matter which he coughed up on the surrounding turf, he frequently saw it eaten by chickens, in whom it produced *vestigo terminating in a transient state of insensibility and loss of muscular power.* The intelligence and veracity of both the patient and physician, were such, that we see no reason to doubt the fact.

4. *Death of Dr. Post.*—This distinguished member of the profession died in the city of New-York, on the 14th of June last, in the 63d year of his age. He had been a professor of An-

atomy in his native city, for 32 years—from 1793 to 1825 when he resigned from bad health. As a public teacher, he was much esteemed for his simplicity of manner and his numerous practical facts. The Editors of the New-York Medical and Physical Journal, ascribe to him the enviable distinction of having for 20 years been the 'undisputed head of the profession in that city.' We, ourselves, lately had the pleasure of an interview with the deceased, and were much pleased with his dignity, intelligence and suavity. The Medical Society of New-York, have appointed Dr. John A. Smith, the present professor of Anatomy, in the school to which Dr. P. had belonged, to pronounce his eulogy.

5. *Resignation of Dr. Godman.*—We regret to learn, that the health of our ingenious and estimable friend, professor Godman, of Rutgers' Medical College, New-York, has declined so much, as to make a resignation necessary. On receiving his communication, the President and Faculty resolved, that his ill health was deeply to be regretted, not only as a severe loss to the high standing of the Institution, but more especially for the lively interest they took in the personal welfare of one who had endeared himself to them, by his social virtues, no less than by his intellectual and professional endowments. Dr. Godman's diseases are, in a great degree, the result of an application which has raised him into a distinction which few men of his age have attained in this country. His successor has not yet we believe been appointed.

6. *Tribute of Respect to Dr. Holyoke.*—We are indebted to the last number of the new *Boston Medical and Surgical Journal* for an interesting account of a tribute of respect, which in this instance at least, is honorable to all the parties concerned. Edward Augustus Holyoke, M. D. & L. L. D., of Salem, Massachusetts, within the present moth, having attained to his hundreth year; a number of the most distinguised physicians of Boston and Salem, determined to give him a public dinner, as an evidence of their veneration for his various excellences of character, displayed thro' three successive generations. The following account of the ceremonies of the day will, we are sure, be read with interest.

The venerable Nestor of the profession displayed a degree of health and cheerfulness which cannot be called less than wonderful when connected with his extreme age. The firmness and elasticity of his step, in proceeding to and from the Coffee House, where a dinner was prepared for the occasion, though not an unfrequent subject of observation to the community, all of whom look up to him with more than the veneration due to a father, was viewed with a peculiar interest at that time. His rich and graceful dress, also,—of an ante-revolutionary fashion and texture, resembling neither in form nor colour the garments of modern time, and of which an adequate conception can only be obtained by the examination of ancient portraits,—deserved and received particular notice. The suavity, ease, and highbred politeness of the old school, displayed by the patriarch in receiving the congratulations of his brethren, and in bidding them adieu at the close of the festival, will long be borne in the minds of those who had the happiness to witness his characteristic exhibition of those qualities.

Dr. Holyoke has so long held a distinguished rank in the profession, that forty-seven years ago, when the Massachusetts Medical Society was organized, he was the first to be elected President of that important and useful institution, to which office he was annually elected for several years; and ten years ago, at the age of ninety, he succeeded the late President Adams as President of the American Academy of Arts and Sciences. The celebration was eminently a medical one, designed to show the respect felt by the profession for him who had so long and so honorably practised it. The only guests from without the profession were the Rev. Dr. Prince and Rev. Mr. Brazer, one long an associate and friend, the other the Pastor of Dr. Holyoke. The company, consisting of about fifty physicians of Boston and Salem, were assembled at the Lafayette Hotel in Salem, when a little before two o'clock Dr. Holyoke entered, accompanied by the committee of arrangements. The gentlemen present were severally introduced to him, and soon proceeded to the dining-room, which was tastefully decorated with flowers by some young ladies, assisted by two medical students. The dinner was well ordered and sumptuous. A blessing was asked by Rev. Dr. Prince, and thanks were offered by Rev. Mr. Brazer. Dr. Jackson, President of the Massachusetts Medical Society, presided at the dinner, assisted by Dr. Oliver of Salem, President of the Essex District Society, as Vice President. The following are some of the toasts.

Our venerable guest;—Venerable for his age; still more so for a life devoted to the interests of humanity and sanctified by religion.

Dr. Holyoke then gave the following:

The Massachusetts Medical Society;—May it flourish and prosper, may it continue to improve the Art for which it was instituted, to the utmost of their wishes, and be the means, under Providence, of alleviating the pains and evils of life, and promoting the happiness of society, by suppressing quackery and rendering the business of

the profession as perfect as the nature of things admits. And may each individual of the Society, and every other gentleman here present, enjoy health and prosperity, and the pleasing consciousness that he has contributed somewhat to the advancement and improvement of the public welfare.

This toast was handed to the President in a clear hand writing, having been written by Dr. H. himself without glasses.

Honor to the old age which comes full of honors; to every one that hath shall be given.

The good fellowship of the Medical profession;—In all divisions, let it be our effort to promote an *union by the first intention.*

The Holy-Oak of the American Materia Medica; fructibus decora, sublima attollens ad sidera caput."

Fifteen months ago, we had the honor of a short visit to this venerable centenarian, whom we found disposed and qualified for conversation; and especially inclined to converse on the subject of climate, which had through life been with him a favourite theme. In rising to leave him, he followed us to the door, where we left him making an observation on the state of his thermometer. He is probably the oldest physician living.